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⑤4植物の育成方法及び装置

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明　細　書

1. 発明の名称

植物の育成方法及び装置

2. 特許請求の範囲

(1) 壁の全部又は一部を，通気性で且つ撥水性の連続気孔性多孔質体で構成した容体の内側に植え土を収容し，容体の外側に水を作用させることにより水を水蒸気の形態で容体の多孔質壁内を外側から内側へ透過させて容体内の植え土を湿らせる，ことを特徴とする植物の育成方法。

(2) 連続気孔性多孔質体としてポリテトラフロロエチレンの延伸多孔質体を用いた特許請求の範囲第(1)項記載の植物の育成方法。

(3) 壁の全部又は一部を，通気性で且つ撥水性の連続気孔性多孔質体で構成した植え土収容用内容器と，その内容器と水とを収容する非通水性の外容器とからなる，植物の育成装置。

(4) 壁の全部又は一部を，通気性で且つ撥水性の連続気孔性多孔質体で構成した植え土収容用内容器と，壁の全部又は一部が，通気性で且つ撥水性の連続気孔性多孔質体で構成され，上記内容器と水とを収容する外容器とからなる，植物の育成装置。

(5) 連続気孔性多孔質体がポリテトラフロロエチレンの延伸多孔質体である特許請求の範囲第(3)項又は第(4)項記載の植物の育成装置。

3. 発明の詳細な説明

本発明は，植物の育成方法及び装置に関する。

従来の植物育成手段として，

a. 地面栽培は，肥料が土中に広く浸透拡散したり流出してその損失が大きい。

b. 植木鉢等容器に収容しての栽培は根腐れを防止するために一般に容器の底に水抜き孔が形成されるので保水性が悪く，例えば2日に一度以上等比較的頻繁に水補給をする必要がある。又水補給のたびに水抜き孔から水とともに肥料分も流出する。

c. 植木鉢等容器の下部を水にひたして水の補給頻度を減らす方法は，根腐れを生じさせる原因となる。

d.植木鉢等容器の下部を地面に埋めて水の補給頻度を減らす方法は，作業が大変であるし，又肥料の流損失はまぬがれない。

e.水耕栽培は，水を流動させるか，或は例えば3日に一度以上の頻度で水を交換しないと根腐れを生じさせる原因となる。

本発明は，上記に鑑みて(1)水の補給頻度を例えば7日以上に一度という程度に減少させることができ，(2)肥料の損失がない，(3)根腐れを生じさせない，等の特長を有するユニークな植物育成方法及び装置を提供することを目的とするもので，鉢の全部又は一部を，通気性で且つ撥水性の連続気孔性多孔質体で構成した容体の内側に植え土を収容し，容体の外側に水を作用させることにより水を水蒸気の形態で容体の多孔質壁内を外側から内側へ通過させ容体内の植え土を湿らせるようにしたものである。

通気性で且つ撥水性の連続気孔性多孔質体としては，例えばポリエステル・ポリエチレン・ポリテトラフロロエチレン等撥水性の固体を素

材にしてこれを例えば特開昭52－32976号公報・特公昭51－18991号公報に記載の方法等その他従来公知の適宜の方法でポーラス構造体とした各種の連続微気孔性多孔質体（気孔径例えば0.1～100μm程度）が有効に利用出来る。又撥水性の樹脂繊維を素材にした通気性のフエルト体・布なども利用出来る。

なかでも特公昭51－18991号公報に記載の方法で製造されるポリテトラフロロエチレン（以下PTFEと略記する）製の連続気孔性多孔質体は本発明の実施に極めて有効なものとして推奨される。

一応その製法の概要を述べると，PTFE粉末と液状潤滑剤（例えばソルベントナフサ，ホワイトオイル等の液状炭化水素）との約80：20（重量比）の混和物をラム押出し又は／及び圧延することによりシート状等任意形状の成形体（結晶化度約95％以上）にし，その成形体から液状潤滑剤を抽出または揮発（液状潤滑剤の沸点以上に加熱する）によって除去し，次いで

その成形体を327℃（PTFEの融点）以下の温度で少なくとも一方向に単位時間当りの伸張比率10％／秒以上で延伸する。これにより多数の微小結節が多数のフイブリル（微細繊維）によって互に連結されたPTFEの連続微気孔性多孔質体が得られる。そして該PTFE多孔質体はそのまま即ち未焼成多孔質体として，或は327℃以下の適当な温度で熱セットした半焼成多孔質体として，或は327℃以上に加熱処理した焼成多孔質体として利用される。本発明に於ては未焼成・半焼成・焼成の何れの態様のものも利用出来る。

上記PTFEの延伸多孔質体の諸物性は延伸方向，延伸倍率，単位時間当りの伸張比率，延伸温度，熱セットまたは焼成条件を変化させることにより下記のような広い範囲にわたつて所望に調節することが出来る。

気孔率40～95％，最大孔径0.1～15μm，密度0.15～1g／cm³，ガーレー・ナンバー0.1～100秒，エタノールバブルポイント

0.2～3 kg／cm²，マトリツクス引張り強さ514 kg／cm以上，肉厚0.01 mm以上任意。

そしてPTFE固有の性質により表面は極めて滑性に富み，又優秀な撥水性により水透過率が0～1 cm³／min・cm²・1aq と小さい。又耐熱・耐薬品性に優れている。

本発明は，上記のような通気性で且つ撥水性の連続気孔性多孔質体を利用して鉢の全部又は一部を該多孔質体で構成した容体1を作る。該容体1は，多孔質体単独では容体としての保形性が得にくい場合は，例えば，周壁及び底面に多数の内外貫通孔をあけたプラスチック製・金属製等の剛性容器の内側に多孔質体の膜を内張りする。或は金網・布等を補強部材としてその面に多孔質体の膜を該膜の通気性があまり失なわれない程度に接着剤を用いてラミネートし，該ラミネート材をプレス等の手段で容体1として成形して構成する等すればよい。

そして上記多孔質体で構成した容体1内に植え土2を収容し，その容体1を水5をはつた非

通水性の外容器4内の水に漬けて放置する，或は外容器4内に水を含浸させた例えばスポンジ片・フエルト片・綿等の水含浸体を収容し，その水含浸体中に容体1を埋め込んで放置することにより容体1の外面に水を常時作用させる。

このようにすると，容体1の外側の水3は容体1の壁を構成する多孔質体の通水性によりそれ自体が多孔質体の連続気孔を通つて容体1の内側に浸透することは阻止されるけれども，容体1の多孔質壁外側面と水の接触界面に於て生じる水蒸気31は容易に多孔質壁の連続気孔を通つて容体1の内側へ侵入し，その侵入水蒸気31により容体1内の植え土2に植物の成育に必要な適度の湿りが常時与えられる。5は植え土2に植えた植物の種子を示す。

従つて本発明に依れば

(1)植え土2を収容した容体1の外側に水を多量に存在させておけば，その水が極端に減少するまでは外容器4内への水補給をする必要がなく，水補給間隔を長くすることができる。

(2)又植え土2に施こした肥料は，容体1を構成する多孔質壁が水蒸気・空気等気体以外の液体或は固体を通さない性質のものであるから，容体1の外側に流出することが防止され，肥料の損失を生じない。

(3)又植え土2は常に適度に湿つた状態に保持されて過度の湿潤状態にはならないので根腐れを生じさせることがない。

もので所期の目的がよく達成される。

第1図に於て外容器4は内容器1を収容し且つ内容器1との空間内に適当量の水を収容出来る大きさで非通水性のものであれば材質は問わないが，収容した水3の長期放置による腐敗を防止する目的に於て該外容器4も内容器1と同様に壁の全部又は一部を通気性で且つ通水性の連続気孔性多孔質体で構成することによりその外容器の多孔質壁を通つて外気の酸素が外容器内の水中にとけ込み，水の腐敗が防止される効果が得られる。6は内容器1の外底面を外容器4の内底面から常時浮かせた状態に保持するスペーサ台で，外容器4又は内容器1と一体に形成してもよい。

又第3図のように植物の根を肥料を含ませた植え土2と共に通気性で且つ通水性の連続多孔質壁体1（多孔質壁単体，或は補強部材とのラミネート体）で包み込み，それを地面に植えるようにしてもよく，この場合も地中の水分が水蒸気の形態で壁体1を通つて該内側の植え土2に侵入してその植え土2を常に適度に湿らせると共に，肥料の損失を防止する効果がある。

実施例1

直径約200mm・深さ約100mm・肉厚約1.5mmのプラスチック製内形容器の周壁及び底壁に直径約2mmの多数の内外連通小孔を形成し，その孔あき容器の内面を下記の通気性で且つ通水性の連続微気孔性多孔質膜で内張りし，これを植え土収容用内容器とした。

多孔質膜＝特公昭51－18991号公報に記載の製法に従つて製造（延伸工程；約500C雰囲気で10倍延伸，熱成工程；約540C

5分間）して得た，厚さ約0.04mm，平均気孔径約8μm，気孔率90%，ガーレー・ナンバー1秒，水透過率0.0m^3/min・dm^2・1aqのポリテトラフロロエチレン樹脂の連続微気孔性多孔質膜。

上記内容器内に充分に乾燥させた腐植土を入れ，ひまわり，ニンジン，サルビアの3種類の種を夫々5粒づつ蒔いた。

そして直径約1mの円のタライを外容器として利用し，そのタライ内に上記の内容器を高さ約5cm位のスペーサ台を介して収容し，タライ内に水を入れて内容器の外周を水にひたした状態にして放置したところ，ひまわりは7日後，ニンジンは9日後，サルビアは14日後に夫々発芽し，その後順調に生長し，タライに対する水補給は20日に一度行なう程度で足り，根腐れも生じなかつた。

比較例

水抜き孔のない非通水性容器内に腐植土と水を入れ，ひまわり，ニンジン，サルビアの種を

蒔いて放置したところ，ひまわりは4日後，ニンジンは6日後，サルビアは10日後に発芽したが，20日後には全て根腐れを生じた。

実施例2

補強層として厚さ約0.44 mmのナイロントリコット布を用いその片面に，実施例1で使用したと同じポリテトラフロロエチレン樹脂の連続微気孔性多孔質膜をポリエステル系接着剤を介してラミネートした。尚該接着剤は該接着剤層で多孔質膜の通気性が全面的に失なわれないように薄く，或は点在的に使用する。

そして上記ラミネートシートを熱プレス成形して直径約200 mm・深さ約100 mmの円形容器と，直径約300 mm・深さ約150 mmの内形容器の大小2個の容器を作つた（何れも多孔質ラミネート面が内側）。

小容器を植え土収容用内容器としてその中に充分に乾燥させた粒径約0.3～1 mmの砂利と水溶性肥料の固体物を入れ，ひまわり，ニンジン，サルビアの3種類の種を夫々5粒つつ蒔いた。

そして大容器を外容器としてその中に上記内容器を高さ約5 cmのスペーサ台を介して収容し，内容器と外容器との間に水を入れて放置したところ，ひまわりは8日後，ニンジンは9日後，サルビアは16日後に夫々発芽し，その後順調に生長し，内容器と外容器との間の水面ぬに対する水補給は7日に一度行なう程度で足り，根腐れ，水の腐敗も生じなかつた。

比較例

水抜き孔のない非通水性容器内に実施例2で用いた植え土（砂利）と水を入れ，ひまわり，ニンジン，サルビアの種を蒔いて放置したところ，ひまわりは4日後，ニンジンは5日後，サルビアは9日後に発芽したが，25日後には全て根腐れを生じた。

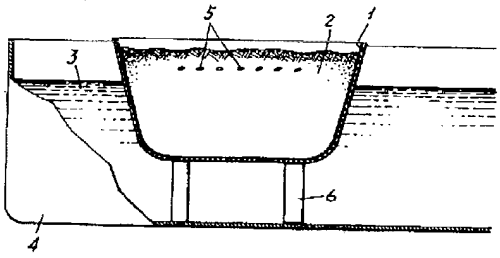
尚，実施例1及び比較例，実施例2及び比較例の環境条件は何れも周囲温度21℃，相対湿度56％である。又充分に乾燥した状態の腐植土又は砂利に種を蒔いただけで水を与えない場合は種の発芽はない。

4.図面の簡単な説明

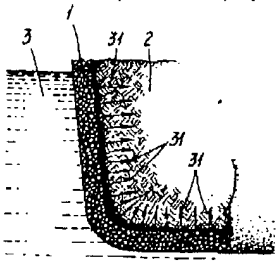
第1図は本発明育成装置の一例の断面図，第2図は水分の通過状態説明図，第3図は種物の根部分を撥水性で且つ通気性の連続微気孔性多孔質膜で包んで地面に植えた状態図。

1は通気性で且つ撥水性の連続気孔性多孔質体製の容体，2は植え土，3は水，4は外容器，5は種，6はスペーサ台。

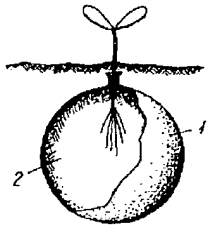
第1図



第2図



第3図



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PLANT GROWING METHOD AND DEVICE
[Shokubutsu no Ikusei Hoho oyobi Sochi]

Yosuke Suzuki

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Specifications

1. Title of the Invention

Plant Growing Method and Device

2. Claims

(1) A method for growing plants characterized by receiving planting soil on the inside of a vessel wherein all or part of its wall is composed mainly of an air-permeable and water-repellent porous body having continuous pores, and dampening the potting soil inside the vessel by allowing water to permeate from the outside to the inside of the porous wall of the vessel in the form of water vapor.

(2) The method for growing plants described in Claim (1) wherein a drawn polytetrafluoroethylene porous body was used as the porous body having continuous pores.

(3) A device for growing plants which comprises an inner container for receiving potting soil wherein all or part of the wall is composed of an air-permeable and water-repellent porous body having continuous pores and a water-impermeable outer container which receives the inner container thereof and water.

(4) A device for growing plants which comprises an inner container for receiving potting soil wherein all or part of its wall is composed of an air-permeable and water-repellent porous body having continuous pores and an outer container wherein all or part of its wall is composed of an air-permeable and water-repellent porous body

having continuous pores and receives the above-mentioned inner container and water.

(5) The device for growing plants described in Claim (3) or (4) wherein the porous body having continuous pores is a drawn polytetrafluoroethylene porous body.

3. Detailed Specifications

The present invention relates to a method and device for growing plants. There are as conventional plant growing means,

a. ground cultivation: fertilizer permeates and diffuses widely in the soil and runs off; hence, its loss is high;

b. cultivation in containers, such as flowerpots: the water-holding capacity is poor because a drainage hole for water is formed in the bottom of the container to prevent root rot. For example, it is necessary to water relatively often, e.g., at least once every two days. There is also run-off of fertilizer with the water through the drainage hole each time watering is done;

c. methods for reducing the watering frequency by submerging the lower part of a container, such as a flower pot, in water: this method causes root rot to occur.

d. methods for reducing the watering frequency by burying the lower part of the container, such as a flower pot, in the ground: this is an enormous job and the loss from run-off of fertilizer cannot be avoided.

e. hydroponics: causes root rot to occur if the water does not flow or the water is not replaced at a frequency of at least once every three days.

The object of the present invention is to obtain a unique plant growing method and device having merits, such as (1) being able to reduce the watering frequency to, e.g., once every seven days or longer, (2) eliminating the fertilizer loss, and (3) allowing no root rot to occur. Planting soil is received on the inside of a vessel wherein all or part of its wall is composed mainly of an air-permeable and water-repellent porous body having continuous pores, and the potting soil inside the vessel is dampened by allowing water to permeate from the outside to the inside of the porous wall of the vessel in the form of water vapor.

Various porous bodies having continuous pores (the porosity is, e.g., about 0.1 to 100 μm) wherein a water-repellent resin, such as polyester, polyethylene and polytetrafluoroethylene, was made the raw material and this was made a porous structure according to, e.g., the methods disclosed in Tokkai no. 52-32976, Tokko no. 51-18991 and other suitable well-known conventional methods can be utilized effectively for the air-permeable and water repellent porous body having continuous pores. Highly dense felt materials and cloth, and the like, with water-repellent resin fibers as the raw material also can be utilized.

Of these, it is surmised that a porous body having continuous pores made of polytetrafluoroethylene (abbreviated "PTFE," below) which is manufactured in the method described in the publication of Tokko no. 51-18991 is extremely effective for carrying out the present invention.

A summary of the method for manufacture thereof will be described first. By subjecting an admixture of PTFE powder and a liquid lubricant (e.g., liquid hydrocarbons, such as solvent naphtha and white oil) to ram extrusion and/or rolling at a weight ratio of about 80:20, a molding (degree of crystallization: about 95% or higher) having any given shape, such as a sheet shape, is made, the liquid lubricant is removed by extraction or volatization (by heating to the boiling point of the liquid lubricant or higher), and the molding thereof is drawn in at least one direction at a drawing ratio of at least 10%/sec. per unit time and at a temperature of at most 327°C (the melting point of PTFE). A PTFE porous body having continuous [illegible] pores, wherein numerous microscopic nodules are connected to each other by numerous fibrils ([illegible] fibers), is obtained. And then the PTFE porous body is utilized as an unsintered porous body (that is, as is), as a semi-sintered porous body set by heating at a suitable temperature, i.e., at most 327°C, or as a sintered porous body which was heat treated at 327°C or higher. Any of these states (unsintered, semi-sintered or sintered) can be utilized in the present

invention.

By changing the drawing direction and magnification, the drawing ratio and temperature per unit time, and the heat setting or sintering conditions, many physical properties of the above-mentioned drawn PTFE porous body can be adjusted to the desired wide ranges, as stated below.

Porosity: 40 to 95%; maximum pore size: 0.1 to 15 μm; density: 0.15 to 1 g/cm^3; Gurley number: 0.1 to 100 seconds; ethanol bulb point: 0.2 to 3 kg/cm^2; matrix tensile strength: 514 kg/cm or higher; thickness: 0.01 mm or higher.

And so the surface is extremely abundant in smoothness due to the unique PTFE properties, the water permeability is low, at 0 to 1 cm^3/min-dm^2, due to the superior water repellency, and the heat and chemical resistance are excellent.

The present invention utilizes the air-permeable and water-repellent porous body having continuous pores, as described above, and a vessel **1**, wherein all or part of the wall is composed of the porous body. When the shape retainability of the vessel is hardly obtained by the porous body alone, for example, the vessel **1** should be composed by [illegible]ing the film of the porous body on the inside of a rigid container made of plastic, metal, and the like, in which numerous internal and external through-holes are formed in the peripheral wall and the bottom, or by laminating a porous film on the surface thereof

by using an adhesive to the extent that the air permeability of that film is not lost excessively, and then molding the laminated material as the vessel **1** by a means, such as a press.

And then, by receiving planting soil **2** into the vessel **1** composed of the above-mentioned porous body, and setting the vessel **1** aside in the water inside a water-impermeable outer container **4** filled with water **3**, or by receiving a water-impregnated body, which is, e.g., a piece of sponge or a piece or [illegible] of felt impregnated with water, inside an outer container **4**, and embedding the vessel **1** in the water-impregnated body thereof and setting it aside, the water acts on the outer surface of the vessel **1** ordinarily.

Although the water **3** on the outside of the vessel **1** is prohibited from permeating the vessel **1** through the continuous pores of the porous body per se due to the water-repellency of the porous body constituting the walls of the vessel **1**, the water vapor **31** generated in the contact interface of the water with the outer surface of the porous walls of the vessel **1** invades the inside of the vessel **1** through the continuous pores in the porous walls, and the planting soil **2** inside the vessel **1** is usually supplied with an excess of moisture required for growing plants due to the invading water vapor **31** thereof. **5** denotes the seed of the plant sewn in the planting soil **2**.

Therefore, according to the present invention, the anticipated object is achieved with ease because of the fact that

(1) a lot of water exists on the outside of the vessel **1** receiving the planting soil **2**. It is not necessary to supply water to the inside of the outer container **4** until the amount of water thereof is greatly reduced, and as a result, the watering time can be postponed;

(2) the fertilizer applied on the planting soil **2** is prevented from running off to outside of the vessel **1** because the porous wall composing the vessel **1** has a property allowing only gases, such as water vapor and air, to pass through it but not liquids or solids;

(3) the planting soil **2** is always kept in an excessively damp state but not an overtly wet state. Hence, no root rot occurs.

The material composing the outer container **4** in Fig. 1 does not matter as long as the size is large enough to receive the inner container **1** and to receive a suitable amount of water in the space of the inner container **1** and it is impermeable to water. But because all or part of the wall of the outer container **4** is composed of an air-permeable, water-repellent porous substance having continuous pores, in the same manner as with the inner container **1,** for the purpose of preventing decay due to long-term standing of the received water **3**, the oxygen in the outside air dissolves in the water by passing through the porous wall of the outer container thereof, which is an

advantage for preventing decay from water. **6** is a spacer stand for supporting the bottom of the inner container **1** on the outside in a state in which is usually is raised from the inside bottom face of the outer container **4**, and it can be formed integrally with the outer container **4** and the inner container **1**.

And as shown in Fig. 3, the roots of the plant are wrapped in the air-permeable, water-repellent continuous porous membrane **1** (a simple porous film, or a laminate of a reinforcing member) along with the planting soil **2** receiving the fertilizer, and it can be grown in the ground. In this case, the moisture in the earth penetrates into the planting soil **2** on the inside of the film through the membrane **1** in the form of water vapor, which is an advantage for always keeping the planting soil **2** excessively damp, and at the same time, preventing the loss of fertilizer.

Practical Example 1

Numerous continuous small holes having a diameter of about 2 mm were formed in the peripheral and bottom walls of a round plastic container having a diameter of about 20 cm, a depth of about 10 cm and a thickness of about 1.5 mm, and the inner surface of the perforated container thereof was lined with the air-permeable and water-repellent porous film having continuous pores described below to make an inner container for receiving planting soil.

The porous film was manufactured according to the method of manufacture described in the publication of Tokko no. 51-18991 (drawing process: draw 10-fold in an approximately 300°C atmosphere; sintering process: 5 minutes at about 340°C) to make a porous film having continuous holes made of a polytetrafluoroethylene resin having a thickness of about 0.04 mm, an average pore size of about 8 μm, a porosity of 90%, a Gurley number of 1 second, and a water permeability of 0 $cm^3/min\text{-}dm^2\text{-}1$ mAq.

Enough dried leaf mold was placed inside the above-mentioned inner container to sew 5 seeds at a time of three kinds, i.e., sunflower, carrot and salvia, respectively.

And then an approximately 1 m diameter basin was utilized as the outer container, the above-mentioned inner container was received inside the basin thereof with the aid of an approximately 5 cm high spacer stand, water was poured inside the basin and upon setting it in a state in which the outer surface of the inner container was submerged in water, the sunflowers germinated 7 days later, the carrots germinated 9 days later and the salvia germinated 14 days later, respectively, and they grew well after that. The plants were watered sufficiently to the extent of once every 20 days; root rot did not develop.

Comparative Example

Leaf mold and water were placed inside a water-impermeable container without a water drainage hole, and upon sewing sunflower, carrot and salvia seeds and setting them aside, the sunflowers germinated 4 days later, the carrots germinated 6 days later, and the salvia germinated 10 days later, but root rot developed overall 20 days later.

Practical Example 2

An approximately 0.44 mm thick nylon tricot cloth was used as a reinforcing layer and the same polytetrafluoroethylene resin porous film having continuous pores used in Practical Example 1 was laminated on one side thereof with the aid of a polyester-based adhesive. Moreover, the adhesive is spread or dotted all over so that the porosity of the porous film is not lost.

And then, the above-mentioned laminate sheet was subjected to hot pressing and two (2) large and small containers were manufactured, i.e., a round container having a diameter of about 20 cm and a depth of about 10 cm and a round container having a diameter of about 30 cm and a depth of about 15 cm (the porous laminate of both containers was on the inside).

The small container was made the inner container for receiving soil. A mixture of sufficiently dried gravel having a particle size of about 0.3 to 1 mm and a water-soluble fertilizer were placed in it,

and 5 seeds at a time of three kinds of seeds of, i.e., sunflower, carrot and salvia seeds, were sewn.

And then upon making the larger container the outer container, receiving the above-mentioned small container therein with the aid of an approximately 5 cm high spacer stand, and pouring water between the inner container and outer container and setting this aside, the sunflowers germinated 8 days later, the carrots germinated 9 days later, and the salvia germinated 16 days later, respectively, and grew well afer that. They were watered sufficiently to the extent of once every 7 days from the water reservoir between the inner container and the outer container. No root rot developed from the water either.

Comparative Example

Upon placing the planting soil (gravel) used in Practical Example 2 and water inside a water-impermeable container with no drainage hole, sewing sunflower, carrot, and salvia seeds, and setting them aside, the sunflowers germinated 4 days later, the carrots sprouted 5 days later, and the salvia germinated 9 days later, but root rot developed 25 days later overall.

Moreover, the [illegible] conditions in Practical Example 1 and its comparative example and in Practical Example 2 and its comparative example included an ambient temperature of 21°C and a relative humidity of 56%. The seeds do not germinate when water is not supplied even by sewing the seeds in leaf mold or gravel in an

adequately dried state.

4. Brief Description of the Figures

Figure 1 is a cross section of an example of the growing device of the present invention; Figure 2 is an explanatory diagram of the principle of moisture permeation; Figure 3 is a phase diagram of the root part of a plant grown in the ground surrounded by a water-repellent and air-permeable porous body having continuous pores.

1 is a vessel made of an air-permeable and water-repellent porous body having continuous pores; **2** is planting soil; **3** is water; **4** is the outer container; **5** are seeds; **6** is a spacer stand.

Figure 1

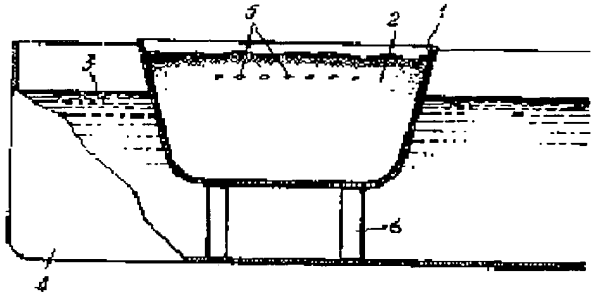

Figure 2

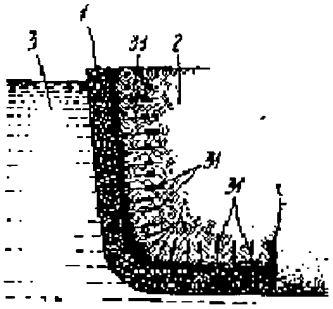

Figure 3